

**REMARKS**

Entry of the foregoing, re-examination and reconsideration of the application identified in caption, as amended, pursuant to and consistent with 37 C.F.R. §1.112 and in light of the remarks which follow, are respectfully requested.

By the above amendments, the claims have been amended in conformance with standard U.S. claims drafting practice by deleting "characterized" and "preferably" therefrom. Claim 1 has been amended for readability by reciting "an aminonitrile" and "the vaporization of the aminonitrile". Claim 3 has been amended for readability by deleting "either of" therefrom. Claims 4-9 and 13 have been amended for readability by deleting "one of" therefrom. Claims 1, 2, 4, 5, 10 and 12 have been amended for readability by replacing "vapour" with "vapor". Claims 9 and 13 have been amended for readability by replacing "evaporator of falling-film type" and "the said system" with "falling-film evaporator" and "the system", respectively.

New claim 14 recites "vaporizing the aminonitrile and the water." New claims 15-20 are directed to subject matter deleted from claims 2, 3, 5, 7 and 14. New claim 21 recites that "the process occurs prior to a reaction between the aminonitrile and the water". Support for new claim 21 can be found in the specification at least at page 3, lines 18-20.

Turning to the Official Action, claims 1-13 stand rejected under 35 U.S.C. §112, second paragraph, for the reasons set forth at pages 3-5 of the Official Action. This rejection should be withdrawn for at least the following reasons.

As discussed above, the objected-to terms "characterized" and "preferably" have been deleted from the claims.

Claim 9 has been rejected for reciting the phrase "performed with a system without retention of liquid". However, it is clear from claim 9 that according to one aspect, a process is performed with a system that does not retain liquid, i.e., the liquid in the system is vaporized. Moreover, the meaning of the objected-to phrase is clear in view of the instant specification at page 7, lines 7-12, which states that "[t]he system for vaporizing the aminonitrile will preferably be selected such that the dwell time of liquid aminonitrile in the said system...is less than or equal to one minute, preferably less than or equal to 5 seconds." As such, the phrase "performed with a system without retention of liquid" recited in claim 9 is not unclear.

The Examiner has objected to the recitation of the word "employed" in the claims. However, reciting "employed" does not by itself render the claims indefinite. For example, claims 2 and 3 recite "is employed at a temperature of", and claim 10 recites "one of the following technologies is employed". The meanings of these phrases are easily understandable and do not render unclear what is being claimed. Moreover, it is respectfully noted that in order to comply with 35 U.S.C. §112, second paragraph, the claims need only "define the patentable subject matter with a reasonable degree of particularity and distinctness."<sup>1</sup> Here, there is no doubt that the present claims clearly define the inventive subject matter.

---

<sup>1</sup>See M.P.E.P. §2173.02 (emphasis in original).

The Official Action at page 3 states the following:

...it is not clear what applicants are claiming because claim 1 does not specify what is obtained after the vaporization of amino nitrile and water. The final product must be recited to make the claim complete.

Contrary to the Examiner's position, it is clear that claim 1 is directed to "[a] process for vaporizing an aminonitrile and water", wherein such process includes using the water in a vapor state as a carrier gas for vaporization of the aminonitrile. Moreover, the second paragraph of 35 U.S.C. §112 simply does not require that a process claim recite the making of a "final product". As such, the Examiner's requirement for including a "final product" in the claims is improper for at least the above reasons. Accordingly, withdrawal of the §112, second paragraph, rejection is respectfully requested.

In the only art rejection, claims 1-13 stand rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 3,658,810 (*Tanaka et al*), International Publication No. WO 98/37063 (WO '063), or International Publication No. WO 96/22974 (WO '974). This rejection should be withdrawn for at least the following reasons.

According to one aspect of the present invention as defined by claim 1, a process is provided for vaporizing an aminonitrile and water, comprising using the water in a vapor state as the carrier gas for the vaporization of the aminonitrile.

As discussed in the instant specification at pages 1 and 2, aminonitrile and water can be reacted together in vapor phase to form a lactam such as caprolactam. However, vaporizing the aminonitrile can result in the decomposition of the aminonitrile into by-products such as amidine-type or polyamidine-type compounds (specification at page 2,

lines 8-13). Further, vaporizing a liquid water/aminonitrile mixture can result in the formation of heavy compounds which can foul the apparatus and/or reduce the service life of a catalyst used in the reaction (specification from page 1, line 20 to page 2, line 2). To ameliorate or eliminate the above problems associated with aminonitrile vaporization, water in a vapor state is used as a carrier gas in accordance with the present invention.

Advantageously, such use of water in a vapor state as a carrier gas can reduce the partial pressure of the aminonitrile, thereby lowering its evaporation temperature and reducing or eliminating the decomposition of the aminonitrile that typically occurs during vaporization.

*Tanaka et al* does not disclose or suggest each feature of the present invention. For example, the process of claim 1 includes using the water in a vapor state as the carrier gas for the vaporization of the aminonitrile. That is, the water in a vapor state is used as a carrier gas during the vaporization of the aminonitrile. By comparison, *Tanaka et al* discloses that  $\epsilon$ -aminocaproic acid,  $\epsilon$ -aminocaproamide or a mixture thereof "can be fed into the reaction system...as solid or as an aqueous solution", and that "the above starting material is fed into the reaction system, and steam is continuously introduced into the system and the starting material is contacted with the steam" (*Tanaka et al* at col. 2, lines 39-41 and col. 3, lines 6-9). That is, *Tanaka et al* discloses a reaction between a solid or liquid starting material and steam. Simply put, there is no disclosure or suggestion of using such steam as the carrier gas for the vaporization of the aminonitrile. And certainly, *Tanaka et al* has no recognition of the advantages of using water vapor as a carrier gas,

i.e., enabling the reduction or elimination of the decomposition of the aminonitrile that typically occurs during vaporization.

Furthermore, the process according to claim 1 is for vaporizing an aminonitrile and water. *Tanaka et al* has no disclosure or suggestion of such feature. Rather, *Tanaka et al* discloses a process for making  $\epsilon$ -caprolactam from  $\epsilon$ -aminocaproic acid,  $\epsilon$ -aminocaproamide or mixtures thereof (*Tanaka et al* at col. 1, lines 26-28). In this regard, the Official Action at page 7 states that "[i]t is obvious to prepare compounds by old method or series of method using like or analogous starting materials." However, it is well established that "there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference".<sup>2</sup> Here, the Official Action provides no scientific reasoning or evidence as to why the recited aminonitrile and the  $\epsilon$ -aminocaproic acid and  $\epsilon$ -aminocaproamide of *Tanaka et al* are in fact "analogous starting materials". Indeed, absent an improper resort to Applicants' own disclosure, one of ordinary skill in the art would not have been motivated to modify *Tanaka et al* in the manner suggested in the Official Action.

For at least the above reasons, *Tanaka et al* does not render obvious the presently claimed invention.

WO '063 relates to a process to prepare  $\epsilon$ -caprolactam by treating 6-aminocaproic acid, 6-aminocaproate ester or 6-aminocaproamide or mixtures comprising at least two of

---

<sup>2</sup>See M.P.E.P. §2143.

these compounds in the presence of superheated steam in which a gaseous mixture comprising  $\epsilon$ -caprolactam and steam is obtained (WO '063 at page 1, lines 7-12).

WO '063 fails to disclose or suggest each feature of the present invention. For example, WO '063 does not disclose or suggest using water in a vapor state as a carrier gas for the vaporization of an aminonitrile, as recited in claim 1. WO '063 does disclose a vapor phase hydrolysis reaction. However, there is no disclosure or suggestion that the starting material for such reaction is vaporized using water in a vapor state as a carrier gas, as in the inventive process. As discussed above, utilizing water in a vapor state as a carrier gas can reduce or eliminate the decomposition of the aminonitrile that typically occurs during vaporization. Simply put, WO '063 has no disclosure or suggestion of such feature, let alone the advantages associated therewith. For at least this reason, WO '063 does not render obvious the presently claimed invention.

With respect to the §103(a) rejection over WO '974, it is clear that a *prima facie* case of obviousness has not been established because the Official Action provides no reason in support of the obviousness rejection over WO '974. Moreover, WO '974 does not appear to disclose or suggest using water in a vapor state as a carrier gas for the vaporization of an aminonitrile, as recited in claim 1.

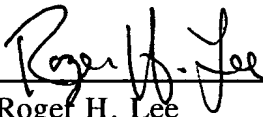
For at least the reasons set forth above, no *prima facie* case of obviousness has been established. Accordingly, withdrawal of the §103(a) rejection is respectfully requested.

From the foregoing, further and favorable action in the form of a Notice of Allowance is believed to be next in order, and such action is earnestly solicited.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By: \_\_\_\_\_

  
Roger H. Lee

Registration No. 46,317

P.O. Box 1404  
Alexandria, VA 22313-1404  
(703) 836-6620

Date: March 13, 2002

**Attachment to AMENDMENT dated March 13, 2002**

**Marked-up claims 1-13**

1. (Amended) Process for vaporizing an aminonitrile and water, [characterized in that] comprising using the water in [the vapour] a vapor state [is used] as the carrier gas for the vaporization of the aminonitrile.

2. (Amended) Process according to claim 1, [characterized in that] wherein the water vapor [vapour] is employed at a temperature of from 120 to 600°C [and preferably from 200 to 550°C].

3. (Twice Amended) Process according to [either of] claim 1, [characterized in that] wherein the aminonitrile is employed at a temperature of from 20 to 300°C [and preferably from 100 to 250°C].

4. (Twice Amended) Process according to [one of] claim 1, [characterized in that] wherein the mixture of aminonitrile in the water [vapour] vapor that is obtained is brought rapidly in a heat exchanger to a temperature at which the vaporization of the mixture is complete.

5. (Twice Amended) Process according to [one of] claim 1, [characterized in that] wherein the mixture of aminonitrile in the water [vapour] vapor that is obtained is brought



**Attachment to AMENDMENT dated March 13, 2002**

**Marked-up claims 1-13**

to the temperature of reaction between the aminonitrile and water[, preferably to a temperature of from 200 to 450°C and, more preferably, from 250 to 400°C].

6. (Twice Amended) Process according to [one of] claim 1, [characterized in that] wherein the aminonitrile is a linear or branched aliphatic aminonitrile having 3 to 12 carbon atoms.

7. (Twice Amended) Process according to [one of] claim 1, [characterized in that] wherein the aminonitrile originates from the hydrogenation to a primary amine function of one of the two nitrile functions of a dinitrile selected from adiponitrile, methylglutaronitrile, ethylsuccinonitrile, dimethylsuccinonitrile, malononitrile, succinonitrile, glutaronitrile and dodecanedinitrile [and is preferably 6-amino-capronitrile].

8. (Twice Amended) Process according to [one of] claim 1, [characterized in that] wherein the vaporization of the aminonitrile is conducted under an absolute pressure of from 0.1 to 3 bar.

9. (Twice Amended) Process according to [one of] claim 1, [characterized in that] wherein it is performed with a system without retention of liquid.

**Attachment to AMENDMENT dated March 13, 2002**

**Marked-up claims 1-13**

10. (Amended) Process according to claim 9, [characterized in that] wherein one of the following technologies is employed:

- evaporation of the aminonitrile as a film on a heated surface, in [an] a falling-film evaporator [of falling-film type];
- evaporation of an at least partly liquid mist of aminonitrile in the superheated water [vapour] vapor.

11. (Amended) Process according to claim 10, [characterized in that] wherein the distribution of the aminonitrile over the tubes of the falling-film evaporator is carried out by:

- supplying the at least partly liquid aminonitrile to the tube plate, then distributing this aminonitrile in each tube;
- distributing the at least partly liquid aminonitrile in each tube by atomization to a mist of the aminonitrile above the tube plate.

12. (Amended) Process according to claim 10, [characterized in that] wherein the evaporation of an at least partly liquid mist of aminonitrile in superheated water [vapour] vapor is single-stage or multistage.

**Attachment to AMENDMENT dated March 13, 2002**

**Marked-up claims 1-13**

13. (Twice Amended) Process according to [one of] claim 1, [characterized in that] wherein the system for vaporizing the aminonitrile is selected such that the dwell time of liquid aminonitrile in the [said] system is less than or equal to one minute[, preferably less than or equal to 5 seconds].